

FIELD NOTES ON NIGERIAN *STRIGA* (SCROPHULARIACEAE)

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Striga is a palaeotropical genus of perhaps as many as 50 species, although the genus has not been monographed. Like many Scrophulariaceae, *Striga* is root parasitic. In fact, several species are of great economic importance, particularly in the semi-arid tropics. In the rain fed areas of subsaharan Africa *S. hermonthica* (Del.) Benth. is an ubiquitous weed in guinea corn (*Sorghum bicolor*) fields. In some areas it is the single most serious parasite of this main crop of subsistence farmers. Millet (*Pennisetum typhoides*) may also be attacked by this species. *Striga gesnerioides* causes damage to a variety of crops, including legumes and tobacco. Witchweed (*S. asiatica*) is the most widespread species in the genus, extending across Africa, the Indian subcontinent, and into Indonesia. It parasitizes corn, rice, sugar cane, and other members of the Poaceae. *Striga angustifolia* (Don.) Saldanha (= *Striga euphasioides* Benth.) is an important parasite on sorghum in India. These and a few other species are briefly discussed in Hosmani (1978).

Two species have been accidentally introduced to the New World. In the 1950s *S. asiatica* (L.) Kuntze (= *S. lutea* Lour.) was discovered in the Carolinas. It is presently known from several counties in southeastern North Carolina and adjacent South Carolina. It is now the object of a federal quarantine and eradication program. Very recently *S. gesnerioides* (Willd.) Vatke was discovered in Polk Co., Florida (Wunderlin, Musselman and Shuey, 1979). The extent of this infestation is being investigated.

The most useful aid to identification of African material is found in Hepper (1963). Characters of diagnostic value in separating species include number of ribs in the calyx, indumentum, relative size of calyx and of corolla tube, size of the bract subtending each flower, and flower color. Like several other genera of parasitic angiosperms that exhibit reduction of vegetative parts, floral characters are the main basis of taxonomic differences in *Striga*. Plants are often confused in the field, however, particularly *S. aspera* and *S. hermonthica*.

Despite its agronomic importance, very little information of a descriptive

nature is available for the genus, especially for those species that are not serious pathogens. The purpose of this paper is to record field observations on several species of *Striga* observed in Nigeria in October and November 1978.

Specimens were collected from Kazaure in northern Nigeria near the border with Niger and southeast along the main road south to Mokwa. This transect crosses several rainfall isohyets from 750 mm/year in the north to 1500 mm/year near Mokwa and corresponds approximately to the vegetational zones known as Sudan Savanna, Northern Guinea Savanna, and Southern Guinea Savanna.

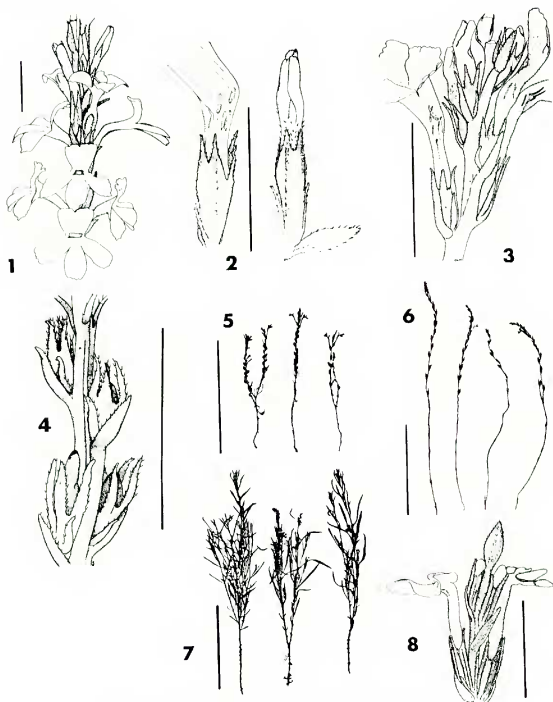
All species of *Striga* are considered noxious weeds in the United States and are under a federal plant quarantine. Therefore, all dried specimens from Nigeria were devitalized by treatment with ethylene oxide at 25 lbs/1000 cu. ft for 2 hours at 70° F or above by the Animal and Plant Health Inspection Service, Plant Protection and Quarantine Programs. These specimens are deposited in the Old Dominion University Herbarium (ODU). Drawings were prepared from FAA preserved material and from Kodachromes. Silhouettes are from actual specimens.

STRIGA HERMONTICA (Del.) Benth.

This is a strikingly beautiful species with large pink flowers. Of the six species examined, only *S. hermonthica* has more than two corollas open per inflorescence branch and flowers that last more than one day (Fig. 1). Widespread throughout the drier regions of Africa, it is quite variable. A cursory examination of populations parasitizing sorghum at Musasa and Zaria (Both Kaduna State, Nigeria) revealed the following corolla variations: upper lobe entire to almost bifid, orifice of throat white or pink, and lower lobes deeply toothed to entire. The extent of this variation among populations remains to be determined as does its source. Of greater agronomic importance is the physiological variation within the species. Preliminary work by C. Parker (personal communication) of the Weed Research Organization indicates that *S. hermonthica* may exist as two strains—one attacking millet, the other sorghum. In the present study "millet" *S. hermonthica* was examined at Mokwa and appeared morphologically identical to that growing on sorghum. Like other species of *Striga*, little is known regarding floral biology despite the potential value of such work on a parasite that reproduces entirely from seed. However, preliminary work by Parker (personal communication) suggests that at least some populations are distinctly out-crossing.

STRIGA ASPERA (Willd.) Benth.

Striga aspera and *S. hermonthica* are superficially quite similar and may be found growing together. They may be readily separated, however, on the basis of bract size and corolla pubescence. The bract subtending the



(Scale for silhouettes equals 10 cm, for drawings 1 cm)

- Fig. 1. *Striga hermonthica*, portion of inflorescence.
 Fig. 2. Calyces of *S. hermonthica*. Figure on right shows lateral bract. Smaller structures are bracteoles.
 Fig. 3. *S. aspera* inflorescence; *Musselman and Mansfield 5524*.
 Fig. 4. *S. aspera*, diminutive plant from Kuffena Rock; *Musselman and Mansfield 5530*.
 Fig. 5. Same as Fig. 4, showing aspect.
 Fig. 6. *S. asiatica*, Tegna; *Musselman and Mansfield 5531*.
 Fig. 7. American strain of *S. asiatica* from U.S.D.A. Witchweed Laboratory.
 Fig. 8. Flowers of *S. asiatica*; *Musselman and Mansfield 5531*.

flower of *S. aspera* is almost as long as the calyx (Fig. 4) while the bract of *S. hermonthica* is much shorter than the calyx (Fig. 2). The entire external portion of the corolla of *S. aspera* is covered with glandular hairs (Fig. 2) while *S. hermonthica* lacks glands (Fig. 2). Additional differences include the more abrupt angle of the corolla tube of *S. hermonthica* (Fig. 2, left) and the larger lower leaves. The two species are also somewhat different in their ecology, *S. aspera* being more commonly found in natural grasslands and *S. hermonthica* as a weed in sorghum. However, *S. aspera* has also been found to parasitize sorghum but has been invariably assumed to be *S. hermonthica* in such cases. Plants of *S. aspera* from Kuffena Rock, a massive granite Inselberg near Zaria, were diminutive but possessed the characteristic bracts and pubescence (Fig. 5).

STRIGA ASIATICA (L.) Kuntz

The most widely distributed of all species in the genus and a serious pathogen throughout most of its range, *S. asiatica* is not a problem in Nigeria despite the planting of corn (*Zea mays*) on a large scale in some places. Plants were growing on an ironstone outcropping near Tegna, Kaduna State, in a stand of native grasses. The overall form of these plants was quite different from that of the strain introduced to the United States (cf. Fig. 6 and 7). The Nigerian plants were much more pubescent than the American strain (Fig. 8). The American strain has recently been shown to be autogamous (Nickrent and Musselman 1979). While more careful studies are necessary, it appears that plants in the Tegna population were not autogamous.

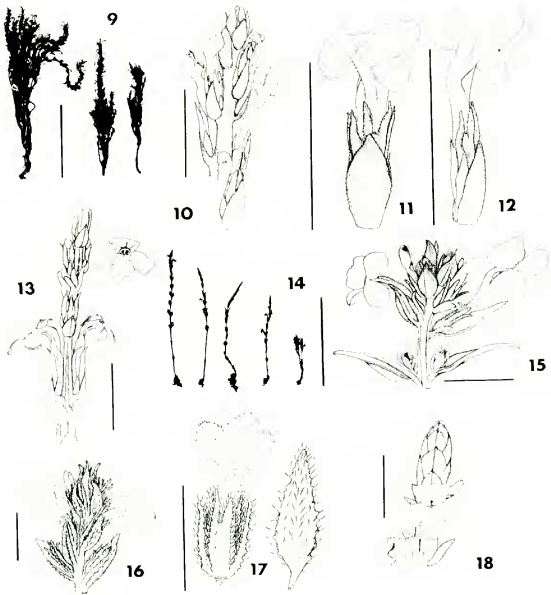
STRIGA GESNERIOIDES (Willd.) Vatke

Unlike the other species in this study, *S. gesnerioides* does not parasitize grasses. It is a serious parasite of cowpeas (*Vigna unguiculata*). In other parts of its range it is known to parasitize tobacco (Hosmani 1978). Two distinct strains were observed in this study. The first is the widespread cowpea strain (Figs. 9-12), the second was seen only at Mokwa, Niger State and was parasitizing a weedy legume *Tephrosia pedicellata* (Figs. 13, 14). To our knowledge, there is no formal taxonomic difference between these two strains. They are, however, quite different in some aspects of their morphology and growth habit. The flowers of the Mokwa strain were more pink than the cowpea strain, the size of the bract was also different (cf. Fig. 9 with 13). Most, striking, however, is the general habit of the plant. The Mokwa strain only rarely branched (Fig. 14), while the cowpea strain branched repeatedly at the ground level (Fig. 9).

The strain of *S. gesnerioides* recently introduced into Florida most closely resembles the Mokwa strain (Wunderlin, Musselman and Shuey 1979).

STRIGA MACRANTHA Benth.

Unlike the four species discussed above, *S. macrantha* and *S. klingii* are



(Scale for silhouettes equals 10 cm, for drawing 1 cm)

Fig. 9. Cowpea strain of *Striga gesnerioides*, Kazure; Musselman and Mansfield, 5526.

Fig. 10. Inflorescence of cowpea strain.

Figs. 11 and 12. Individual flowers of cowpea strain of *S. gesnerioides* show size of bract relative to calyx.

Fig. 13. Mokwa strain of *S. gesnerioides*; Musselman and Mansfield, 5534.

Fig. 14. Mokwa strain of *S. gesnerioides* showing aspect.

Fig. 15. Inflorescence of *S. macrantha*, Tegna; Musselman and Mansfield, 5522.

Fig. 16. Inflorescence of *S. klingii*, Mokwa; Musselman and Mansfield, 5533.

Fig. 17. Flower and bract of *S. klingii*.

Fig. 18. Face view of corolla, *S. macrantha*.

not known to be of any economic importance. *Striga macrantha* was collected near Tegna, Kaduna State, on an ironstone outcrop where it was growing with *S. asiatica* in rocky soil amongst grasses. It was up to 1.5 m tall and had large white flowers, apparently the only Nigerian species characterized by that corolla color. The flowers are crowded on a dense spike (Figs. 15, 18) and the bracts and calyces are densely pubescent with both glandular and non-glandular hairs.

STRIGA KLINGII (Engl.) Skan

Great variation in the size of plants were observed in this species. It is apparently a characteristic plant of the dense *Hyparrhenia* (Poaceae) grasslands of the Southern Guinea Savanna. When growing amongst tall grass, the plants are quite short while those on the margin of the grasslands are considerably more robust. This species is characterized by small pink flowers in crowded spikes and hispid hairs on the large bracts (Fig. 16, 17).

A workshop was held in Khartoum, Sudan in November 1978 on *Striga* and *Orobanchae*. Of major concern were *S. asiatica*, *S. angustifolia*, and *S. hermonthica* although some time was devoted to the *S. gesnerioides* problem. The emphasis of the meeting was on control in its broadest sense including breeding for resistance/tolerance in host species. At present one of the more promising means of control is the use of germination stimulants that cause seeds of the parasite to germinate without a host—thus committing "suicide". A group of compounds developed at Sussex University are now being tested for their efficacy in this regard. A summary of this meeting and suggestions for future work will be published in PANS. One critical area includes research on taxonomy and host specificity.

Thus, much opportunity exist for taxonomic research in the genus *Striga*. Unfortunately for American botanists interested in conducting a biosystematic study, the species are under federal quarantine and cannot be grown in the United States without special permission.

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